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PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES

Third Series - Report No. 13
1977 Chrysler 318 CID (5.2L), 2V

D.E. Koehler
W.F. Marshall
K.R. Stamper

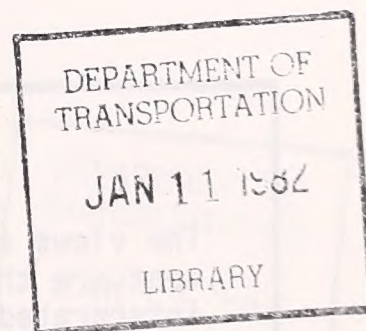
U.S. DEPARTMENT OF ENERGY
BARTLESVILLE ENERGY TECHNOLOGY CENTER
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Bartlesville OK 74003



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INTERIM REPORT

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Washington DC 20590

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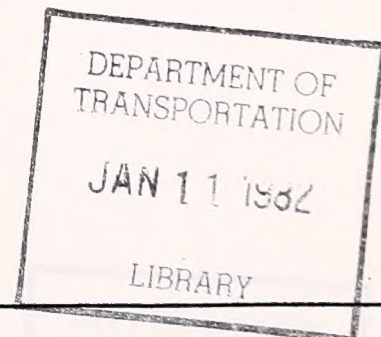
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16. Abstract Experimental data were obtained in dynamometer tests of a 1977 Chrysler 318 CID engine to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady-state engine operating modes. The objective of the program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of the work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.			
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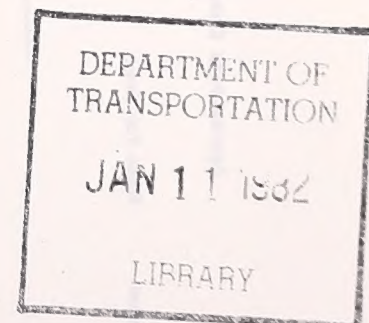


PREFACE

This report, prepared by the U.S. Department of Energy, Bartlesville Energy Technology Center for the U.S. Department of Transportation, Transportation Systems Center, Energy Technology Branch, Cambridge MA, presents results of experimental work to obtain information on performance characteristics of an engine used in automobiles sold in the United States.

This project is funded by the National Highway Traffic Safety Administration, Office of Research and Development, Office of Passenger Vehicle Research, Technology Assessment Division.

Mr. James A. Kidd, Jr. of the U.S. Department of Transportation, Transportation Systems Center, is the technical monitor.



METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

* 1 in. = 2.54 (exact). For other exact conversions and more detailed tables, see NBS Mon. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C1110/286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.6	acres	ac
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	st
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

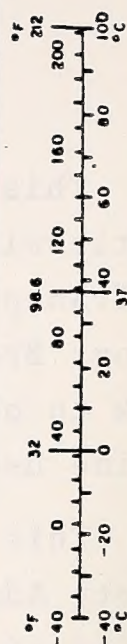


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1. INTRODUCTION

The objective of this program is to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The intent of the work done at the Bartlesville Energy Technology Center is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation.

The data acquired from tests of a 1977 Chrysler 318-CID, 2V engine are presented in this report. Chrysler used this particular engine in the 1977 forty-nine states production of the Plymouth Fury (equipped with automatic transmission). Similar versions of this engine are used to power vehicles in the 4,000 lb to 4,500 lb inertia weight class. The test results are sufficient to establish steady-state maps for fuel consumption and exhaust emissions (carbon monoxide, unburned hydrocarbons, and oxides of nitrogen) over the entire operating range of the engine.

2. ENGINE TEST REPORT

The engine test setup included a complete engine (SAE definition) coupled to an eddy-current dynamometer. A cooling tower was used in place of the fan and radiator. The alternator was included but was not wired into the engine's electrical system. Emission control systems included exhaust-gas-recirculation, positive crankcase ventilation, aspirated air, and an oxidation catalyst. The manufacturer's engine specifications are listed in Table 1.

Prior to testing, the engine was operated at various speeds and loads (designed to approximate road/load conditions) over a 40-hour period for break-in. A single batch of unleaded regular grade gasoline was used throughout the engine break-in and tests; an analysis of the fuel is given in Table 2. Details of the break-in schedule are given in Table 3. The engine tests began on July 12, 1977, and ended on July 20, 1977.

The engine was tested while operating at the following steady-state modes:

Speeds: 1,000; 1,300; 1,600; 2,000; 2,500; 3,000;
3,500; 4,000 rpm

Loads: 0, 10, 25, 40, 60, 75, 90, 100 pct of full
load (0, 10, 25, 40, and 75 pct points were
repeated at each engine speed).

Idle speed-load modes: 800 rpm -- 0, 20, 40 lb-ft
600 rpm -- 40 lb-ft

Over speed point: 4,300 rpm--100 pct of full load

The following data were recorded for each test point:

Test number

Date

Barometric pressure, mm Hg

Dew point, °F

Inlet air temperature, °F
 Speed, rpm
 Torque, lb-ft -- Daytronics strain gauge load cell
 Fuel rate, lb/hr -- Fluidyne positive displacement fuel
 flow meter
 Ignition timing, °BTC
 Manifold vacuum, in. Hg
 Throttle angle, degrees
 CO, pct -- Beckman, NDIR
 CO₂, pct -- Beckman NDIR
 O₂, pct -- Beckman polarographic detector
 HC, ppmC -- Beckman flame ionization detector
 NO_x, ppm -- Thermo-Electron chemiluminescent detector
 Oil temperature, °F
 Oil pressure, psig
 Coolant temperature, °F
 Exhaust temperature, °F
 Exhaust pressure, in H₂O
 Intake manifold temperature, °F

The following equations were used in calculating power, air-fuel ratio (A/F), absolute humidity, and mass emission rates of carbon monoxide (CO), unburned hydrocarbons (HC), and oxides of nitrogen (NO_x):

1. Partial pressure of water vapor in intake air (millimeters of mercury):

$$P = \exp \left[18.717 - \frac{7308.1}{393 + D} \right]$$

where D = Dew point, °F

2. Absolute humidity (grains moisture per pound dry air):

$$H = \frac{4347.8(P)}{B - P}$$

where B = Barometric pressure, mm hg

3. Humidity correction factor (dimensionless):

$$K_H = \frac{1}{1 - 0.0047(H - 75)}$$

Note: This factor is used to correct the NO_x mass emission rate to a standard humidity of 75 grains moisture per pound dry air.

4. Stoichiometric air/fuel rate (dimensionless):

$$AF_s = \frac{69(2 + x/2 - y)}{MW_{\text{fuel}}}$$

where x = Hydrogen-carbon ratio of fuel

y = Oxygen-carbon ratio of fuel

MW_{fuel} = Fuel molecular weight per carbon atom
 $= 12.01115 + 1.00797x + 16.00000y$

5. Hydrogen concentration in raw exhaust (percent):

$$H_2 = \frac{x(\text{CO})(\text{CO} + \text{CO}_2)}{2(\text{CO} + 3\text{CO}_2)}$$

where CO = Carbon monoxide concentration (percent)

CO_2 = Carbon dioxide concentration (percent)

Note: This equation assumes a water-gas shift equilibrium constant:

$$\frac{(\text{CO})(\text{H}_2\text{O})}{(\text{CO}_2)(\text{H}_2)} = 3$$

6. Correction factor for emission concentrations from wet basis to dry basis (dimensionless):

$$C_w = 1 + \frac{(x/2)(\text{CO} + \text{CO}_2) - H_2}{100}$$

Note: In these tests only HC is measured on a wet basis. All other species are measured on a dry basis.

7. Air-fuel ratio (dimensionless):

$$AF = \frac{AF_s}{2 + x/2 - y} \left[\frac{(1 + \frac{x}{2} - y)(CO) + (2 + \frac{x}{2} - y)(CO_2) + 2(O_2) + \frac{NO_x}{10^4} - H_2}{CO + CO_2 + C_w (HC/10^4)} \right]$$

where O_2 = Oxygen concentration (percent)

NO_x = Oxides of nitrogen (ppm)

HC = Unburned hydrocarbon concentration (ppmC)

8. Exhaust flow (pounds per hour):

$$M_{EX} = M_F(1 + AF)$$

where M_F = fuel flow rate (pounds per hour)

9. Carbon monoxide mass emission rate (grams per hour):

$$M_{CO} = \frac{MW_{CO}}{MW_f} * \frac{\%CO * M_f}{\%CO + \%CO_2 + C_w(\%HC)} * 453.59237$$

MW_{CO} = Molecular weight of CO (28.01055)

MW_f = Molecular weight of fuel ($112.01115 + 1.00797x + 16.00000y$)

M_f = Fuel rates in lbs/hour

$\%HC$ = $HC(ppm)/10^4$

10. Unburned hydrocarbon mass emission rate (grams per hour):

$$M_{HC} = \frac{MW_{HC}}{MW_f} * \frac{\%HC * M_f * C_w}{\%CO + \%CO_2 + C_w(\%HC)} * 453.59237$$

MW_{HC} = Molecular weight of hydrocarbon

= $12.01115 + 1.00797x + 16.00000y$

11. Oxides of nitrogen mass emission rate (grams per hour):

$$M_{NO_X} = \frac{MW_{NO_X}}{MW_f} * \frac{\%NO_X * M_f}{\%CO + \%CO_2 + C_w(\%HC)} * 453.59237 * K_H$$

MW_{NO_X} = Molecular weight of NO_2 = 46.0028

12. Power (brake horsepower corrected to a standard barometric pressure of 736.6 mm Hg and a standard temperature of 85° F):

$$HP = \left(\frac{N * T}{5252.113} \right) * \left(\frac{736.6}{B - P} \right) \sqrt{\frac{t + 460}{545}}$$

where N = Engine speed (revolutions per minute)

T = Brake torque (foot-pounds)

t = Air temperature (°F)

B = Barometric pressure (mm Hg)

P = Partial pressure of water vapor in intake air (mm Hg)

3. DISCUSSION OF TEST RESULTS

The peak value of corrected brake horsepower was found at the engine speed noted in Table 1, but was slightly lower than the quoted value. The maximum torque produced by the engine agreed with the value listed in Table 1. The brake specific fuel consumption (bsfc) of this engine operating at wide-open-throttle (WOT) is shown plotted as a function of engine speed in Figure 1. The engine speed at which minimum values of bsfc were attained coincide with the engine speed at which peak torque values were achieved.

The fuel consumption rate was found to be nearly a linear function of brake horsepower (Figure 2) for each of the engine speeds considered. The A/F ratio was maintained at conditions slightly leaner than stoichiometric for light loads, and became enriched as the power demand increased (Figure 3). The actual combustion chamber stoichiometry is not reflected in all of the A/F measurements due to the introduction of aspirated air into the exhaust gas stream at some speed and load conditions. Typically, the aspirated air was introduced at light load and low engine speed conditions. The emission rates of CO were maintained at low levels for those engine operating points with overall lean A/F due to the action of the oxidation catalyst (Figure 4). The unburned HC emission rates exhibited trends similar to those of the CO, in that the oxidation catalyst maintained low emission rates at each of the engine operating conditions in which there was oxygen available in the exhaust stream (Figure 5). The NO_x emission rates were found to be repeatable at each of the steady-state operating points tested except when A/F was near stoichiometric. In such cases, it was not uncommon to find reductions of the NO_x emission rate across the catalyst (Figure 6); this was the case with the 75 percent load/1,600 rpm test points.

4. CLOSURE

The experimental work to obtain performance data for the Chrysler 318-CID engine has been completed; these data are presented in the tables accompanying this report.

TABLE 1. MANUFACTURER'S ENGINE SPECIFICATIONS

Displacement, cubic inches.....	318
Maximum horsepower, bhp @ 4,000 rpm.....	140
Maximum torque, lb-ft @ 1,600 rpm.....	235
Bore and stroke, inches.....	3.91 and 3.31
Configuration.....	90° v, 8-cylinder
Compression ratio.....	8.5
Firing order.....	1-8-4-3-6-5-7-2
Ignition timing at idle speed, °BTDC @ 850 rpm.....	8
Block material.....	Cast iron
Head material.....	Cast iron
Number of crankshaft main bearings.....	5
Number of compression rings/piston.....	2
Number of oil rings/piston.....	1
Cam drive type.....	Chain
Valve lift:	
Intake, inches.....	0.373
Exhaust, inches.....	0.400
Valve timing:	
Intake opens, °BTC.....	10
Intake closes, °ABC.....	50
Exhaust opens, °BBC.....	52
Exhaust closes, °ATC.....	16
Spark plug gap, inches.....	0.035
Engine weight, lbs.....	575
Exhaust-gas-recirculation system:	
Valve type.....	Poppet
Control signal.....	Amplified manifold and carburetor vacuum
Point of discharge.....	Intake manifold
Crankcase emission control:	
Control method.....	Positive crankcase ventilation
Point of discharge.....	Intake manifold
Carburetor type.....	2-bbl downdraft
Distributor specifications: ¹	
Centrifugal advance, begins, ° @ 600 rpm.....	1.2
Centrifugal advance, intermediate, ° @ 650 rpm.....	2.5
Centrifugal advance, full, ° @ 2,300 rpm.....	8.6
Vacuum advance, begins, ° @ 8 in. Hg.....	1.7
Vacuum advance, maximum, ° @ 13.5 in. Hg.....	11
Carburetor number.....	30637766
EGR valve number.....	3874909
Distributor number.....	4095302

¹Distributor degrees at distributor rpm.

TABLE 2. ENGINE BREAK-IN SCHEDULE

Simulated speed, vehicle, mph	Engine speed, rpm	Intake manifold vacuum, in. Hg	Fraction of time in mode
Idle	800	20	1/10
20	1,000	16.5	"
30	1,300	14	"
40	1,600	11	"
50	1,950	11	"
60	2,250	11.5	"
25	1,150	15	"
35	1,450	12.5	"
45	1,800	11	"
55	2,100	10.5	"

Mileage per cycle = 90 miles.

Total mileage accumulated over 40-hour break-in period = 1,440 miles.

TABLE 3. FUEL ANALYSIS

Fuel No.....	7619
Research octane No.....	91.5
Motor octane No.....	83.5
Specific gravity.....	0.7161
API gravity, degrees.....	66.1
Distillation, °F:	
10 pct evaporated.....	128
50 pct ".....	218
95 pct ".....	404
100 pct ".....	417
Reid vapor pressure, psig.....	9.5
FIA analysis, pct:	
Aromatics.....	6
Olefins.....	17
Paraffins.....	77
Sulfur, pct.....	0.024
Lead, grams per gallon.....	Trace
Hydrogen/carbon atomic ratio.....	2.040

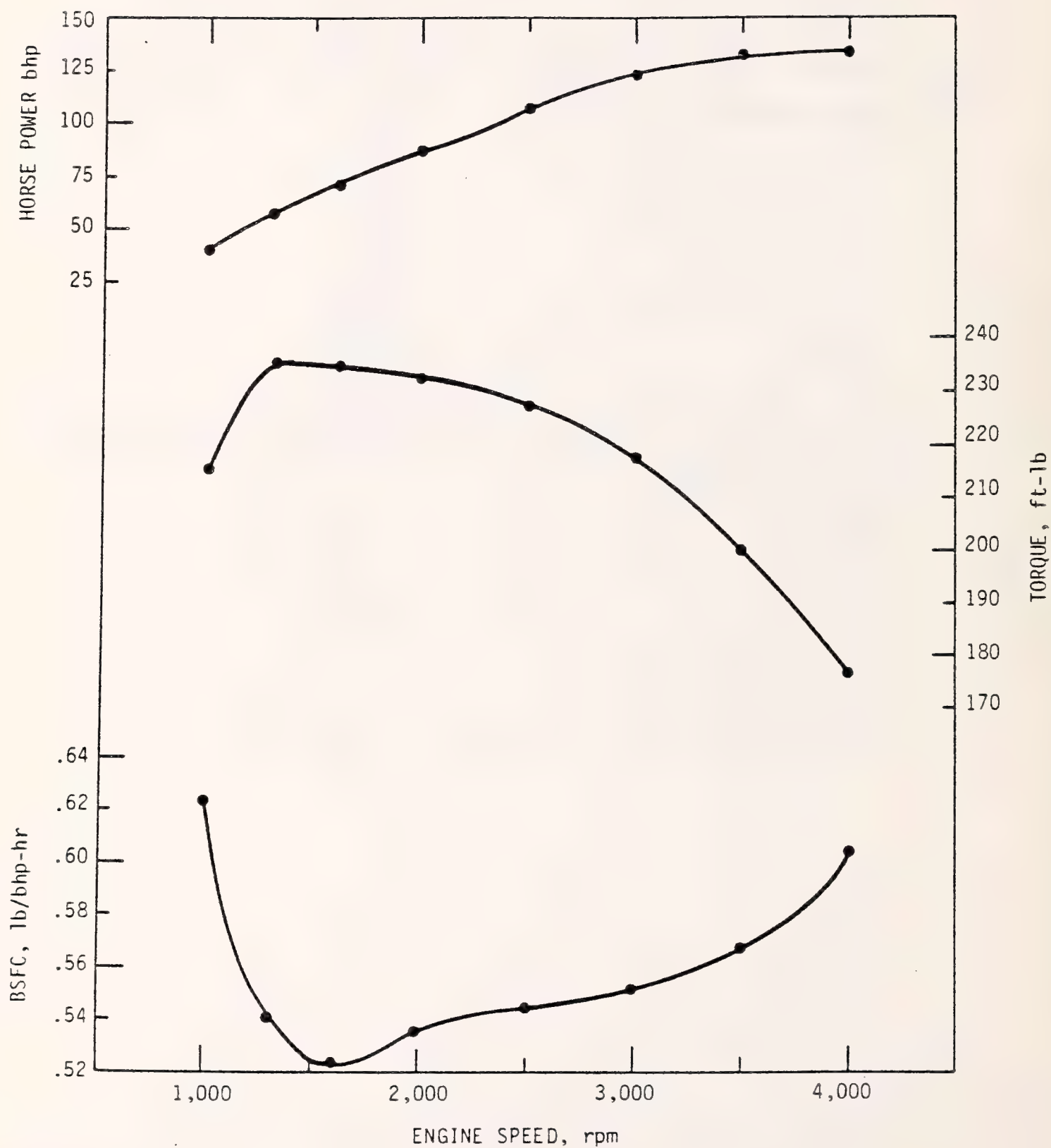


FIGURE 1. BRAKE SPECIFIC FUEL CONSUMPTION, TORQUE, AND BRAKE HORSEPOWER VERSUS ENGINE RPM AT WIDE-OPEN-THROTTLE--CHRYSLER 318-CID ENGINE

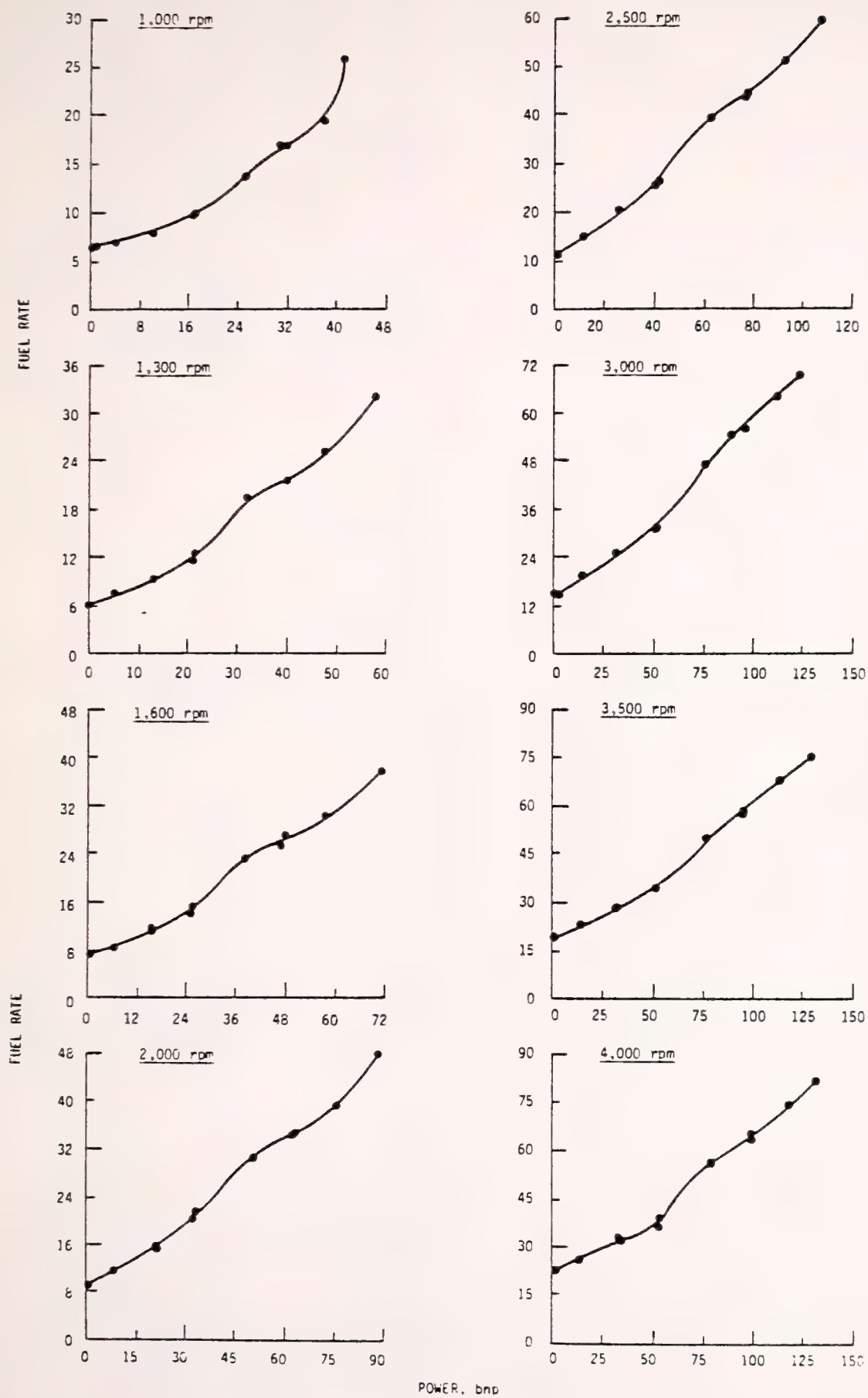


FIGURE 2. FUEL RATE VERSUS POWER AT VARIOUS SPEED AND LOAD CONDITIONS--CHRYSLER 318-CID ENGINE

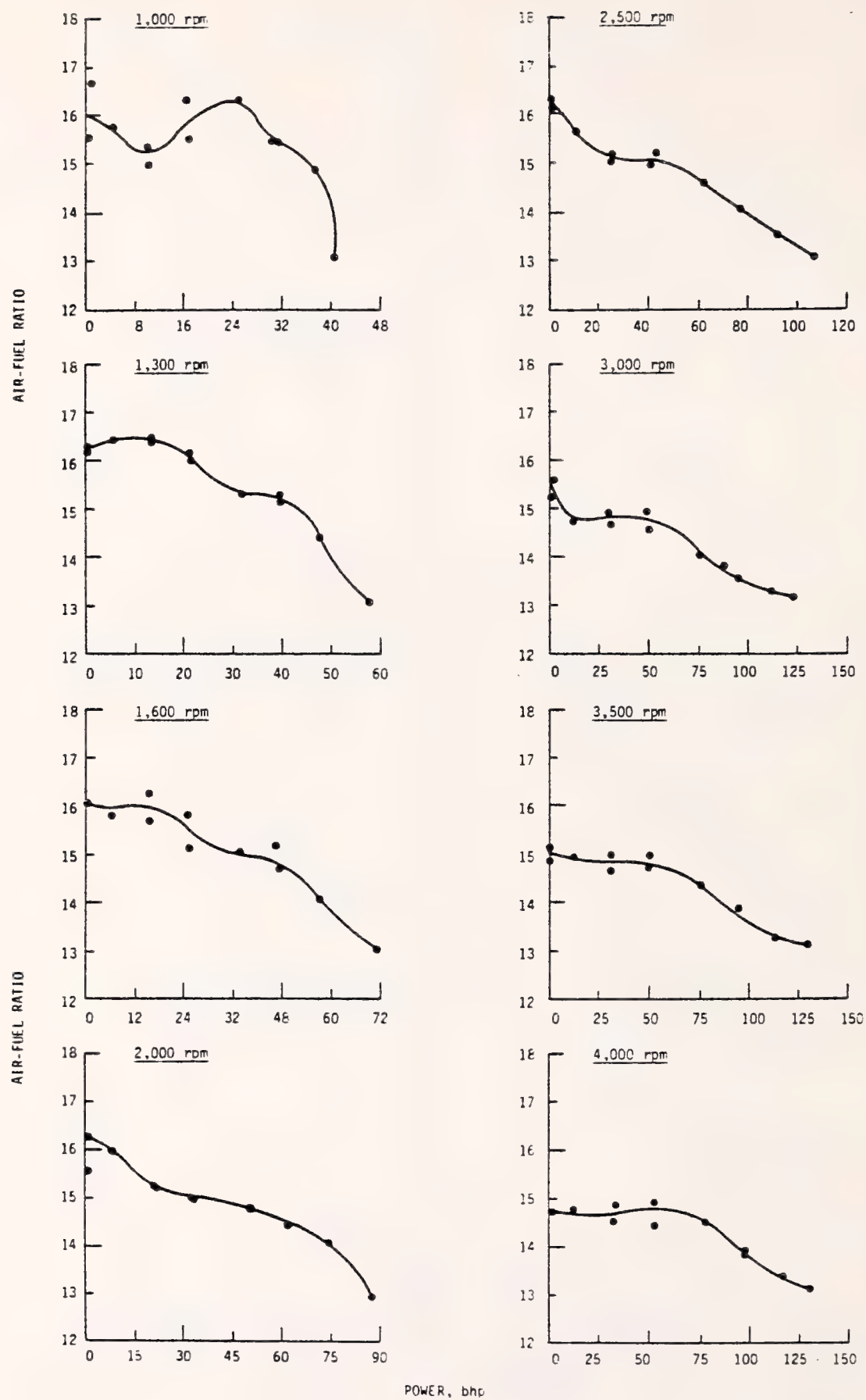


FIGURE 3. AIR-FUEL RATIO VERSUS POWER AT VARIOUS SPEED AND LOAD CONDITIONS--CHRYSLER 318-CID ENGINE

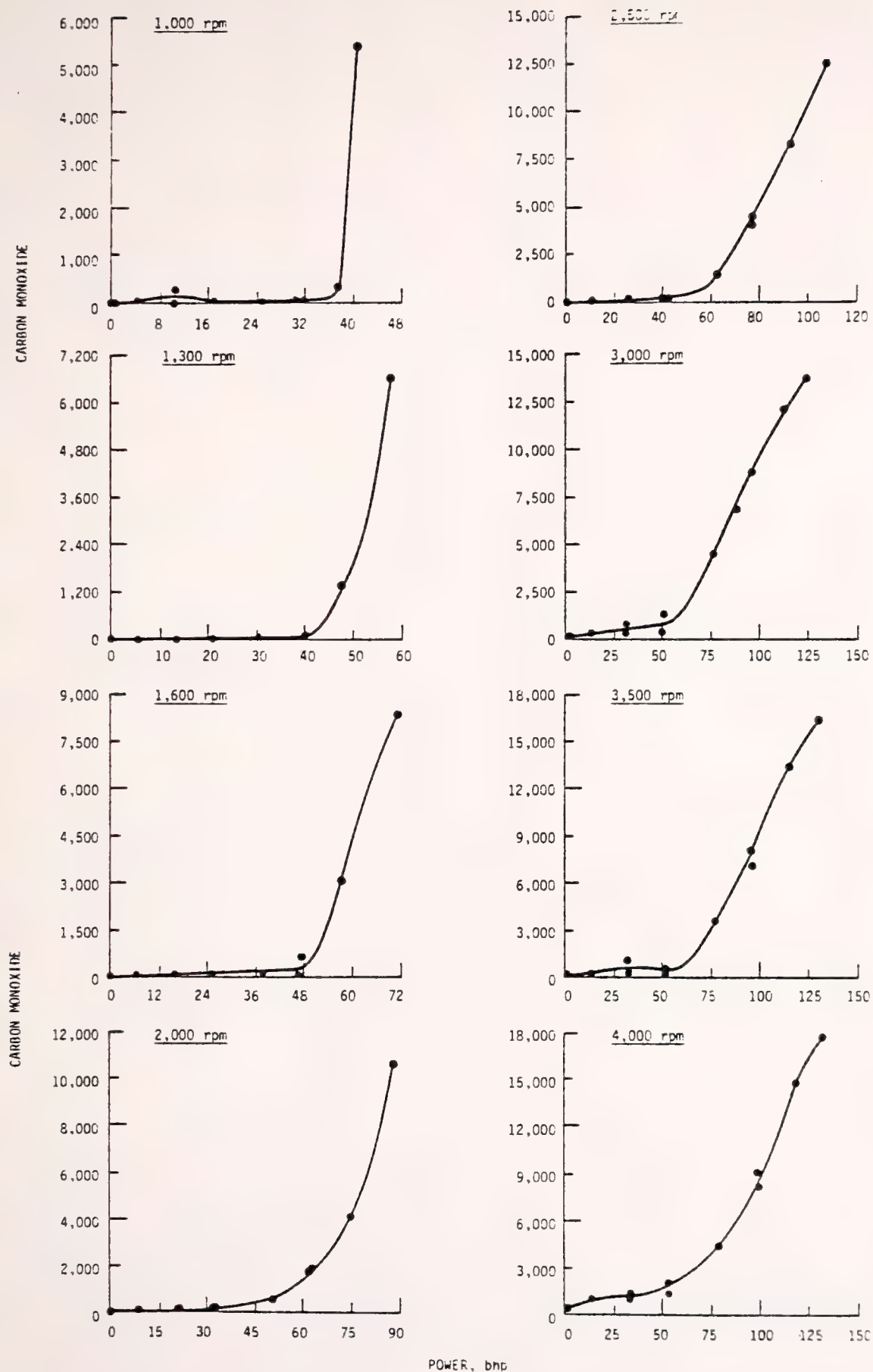


FIGURE 4. CARBON MONOXIDE EMISSIONS VERSUS POWER AT VARIOUS SPEED AND LOAD CONDITIONS--CHRYSLER 318-CID ENGINE

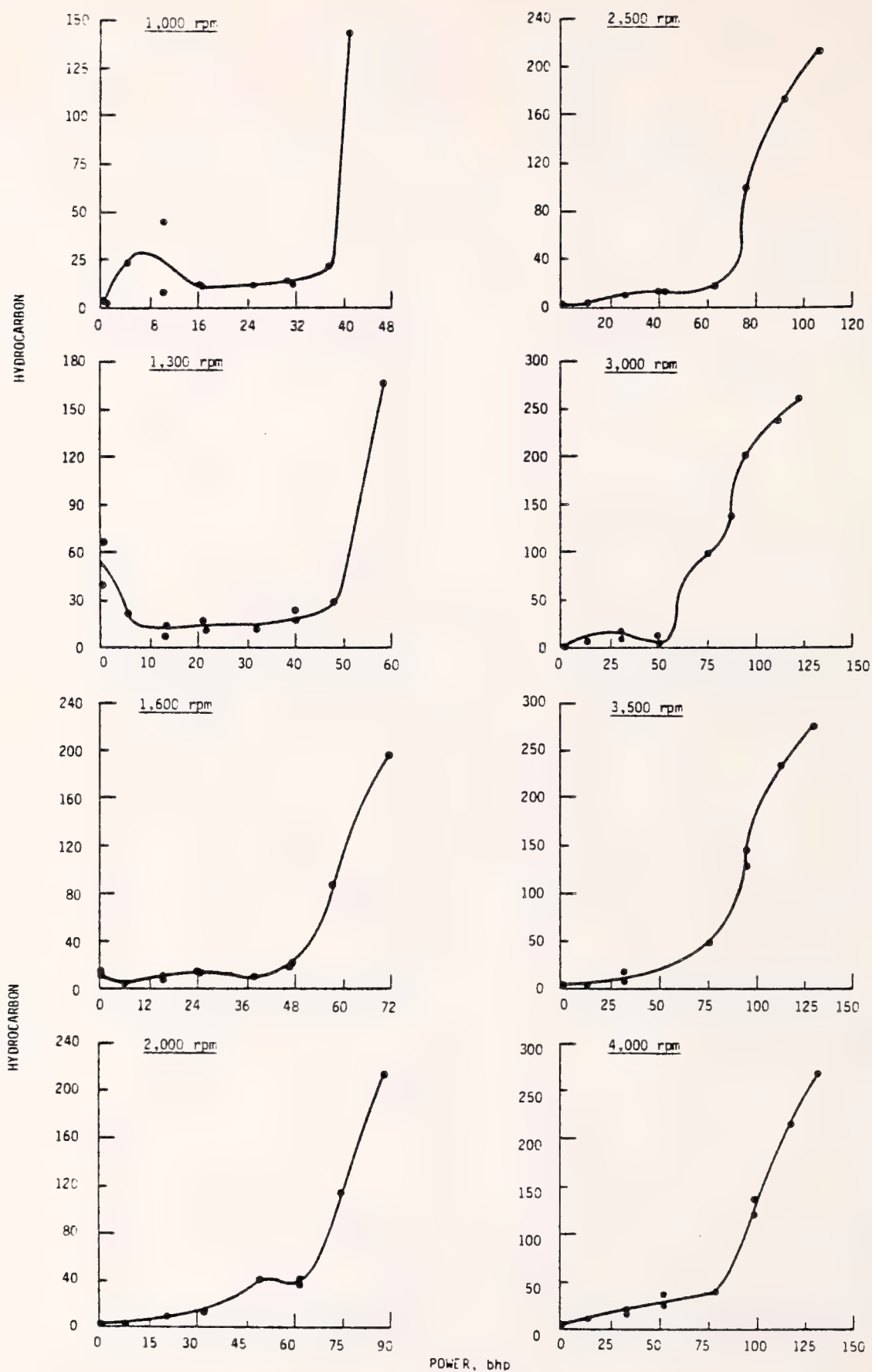


FIGURE 5. HYDROCARBON EMISSIONS VERSUS POWER AT VARIOUS SPEED AND LOAD CONDITIONS--CHRYSLER 318-CID ENGINE

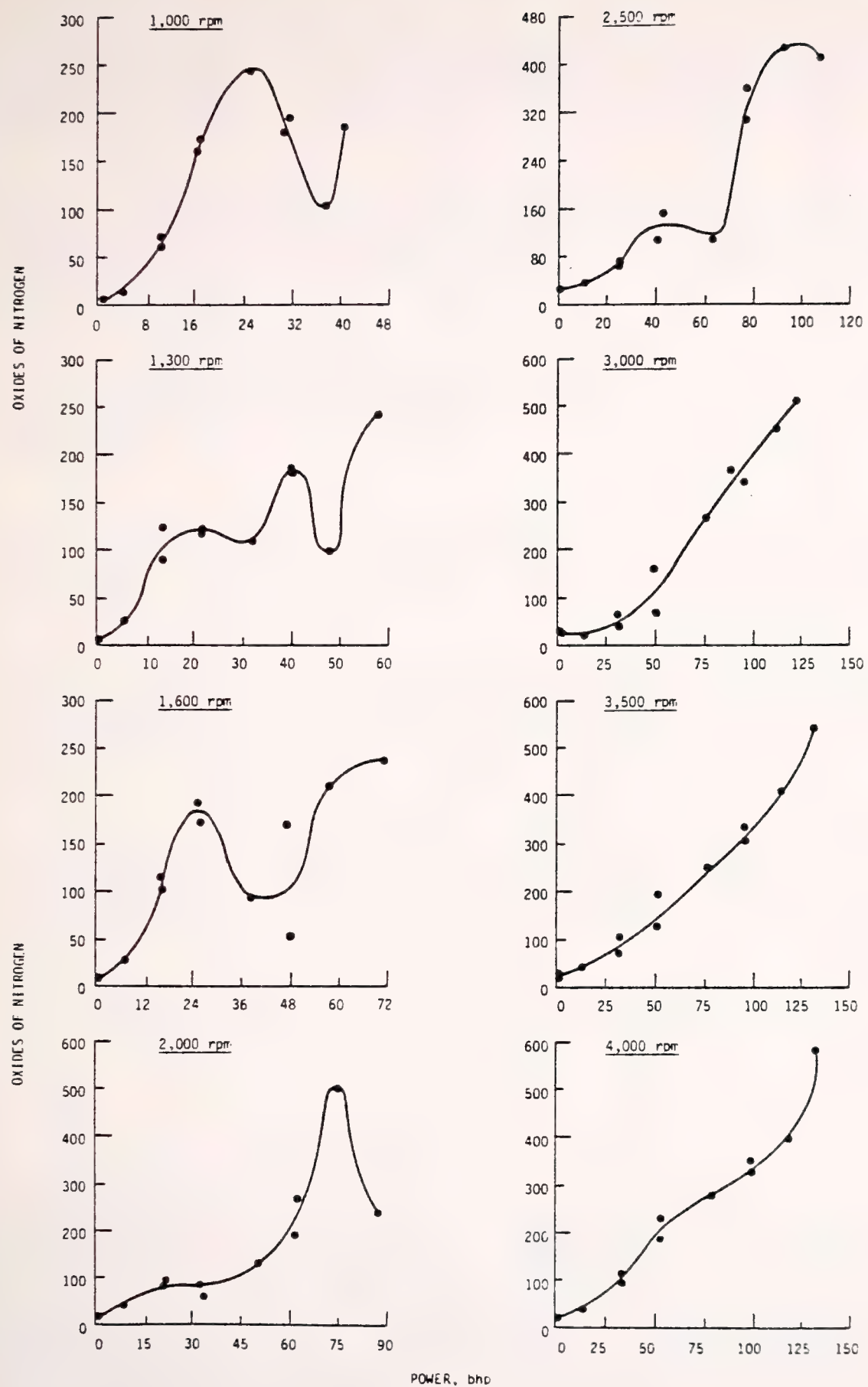


FIGURE 6. OXIDES OF NITROGEN EMISSIONS VERSUS POWER AT VARIOUS SPEED AND LOAD CONDITIONS--CHRYSLER 318-CID ENGINE

ENGINE: CHR318
FUEL CODE: 7619

TEST NUMBER
DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

+ CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

1.01	1.02	2.01	2.02	3.01	3.02
1	2	1	2	1	2
7/12/77	7/12/77	7/12/77	7/12/77	7/12/77	7/12/77
742.5	742.5	742.5	742.5	742.5	742.5
105	105	105	105	105	105
73	73	74	74	74	74
800	800	800	800	800	800
1.0	1.0	20.8	21.9	39.3	40.5
.2	.2	3.2	3.4	6.1	6.3
4.9	4.9	5.7	5.7	6.3	6.3
7.0	7.0	7.0	7.0	8.5	8.5
18.0	18.0	16.5	16.5	16.0	16.0
.5	.5	.5	.5	1.5	1.5
130	130	143	143	135	135
.5305	.0320	.3200	.0245	.2231	.0419
13.30	13.87	13.90	14.05	13.86	13.97
1.30	1.00	1.55	1.35	1.38	1.25
2677	936	1324	296	1659	432
36	47	111	110	228	206
15.19	15.40	15.59	15.71	15.50	15.63
166.4	10.1	115.1	9.0	89.5	17.0
42.2	14.9	23.9	5.4	33.4	8.8
2.2	2.9	7.7	7.7	17.5	16.1
171	171	191	191	191	191
57	57	45	45	43	43
168	168	171	171	172	172
1.0	1.0	2.0	2.0	2.0	2.0
620	620	686	599	675	609

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS
 CO, %
 CO2, %
 O2, %
 HC, PPMC
 NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO
 HC
 NOX+

OIL TEMPERATURE, F
 OIL PRESSURE, PSI
 COOLANT TEMPERATURE, F
 EXHAUST PRESSURE, IN. H2O
 EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

4.01	4.02	5.01	5.02	6.01	6.02
1	2	1	2	1	2
7/12/77	7/12/77	7/20/77	7/20/77	7/12/77	7/12/77
742.5	742.5	741.6	741.6	742.5	742.5
105	105	76	76	105	99
75	75	73	73	77	77
600	600	1000	1000	1000	1000
40.3	40.3	215.0	215.0	193.5	193.5
4.7	4.7	40.9	40.9	37.8	37.7
4.8	4.8	25.5	25.5	19.1	19.1
7.0	7.0	7.0	7.0	7.0	7.0
14.5	14.5	.0	.0	2.0	2.0
.0	.0	73.0	73.0	24.0	24.0
134	134	116	116	116	116
2208	.0231	3.8675	3.9169	.9150	.2529
13.70	13.85	12.09	12.18	13.50	14.40
1.85	1.70	.38	.12	1.10	.26
1591	289	2028	2071	1487	354
161	145	883	820	1375	468
15.84	15.98	13.24	13.07	15.03	14.85
68.4	7.2	5368.4	5366.3	1082.8	296.9
24.8	4.5	141.4	142.5	88.4	20.9
9.6	8.6	202.4	185.3	312.8	102.1
187	187	209	209	202	202
32	32	35	35	43	43
170	170	170	170	171	171
2.0	2.0	18.0	9.0	19.0	11.0
577	524	996	988	1030	1157

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

7.01	7.02	8.01	8.02	9.01	9.02
1	2	1	2	1	2
7/12/77	7/12/77	7/12/77	7/12/77	7/12/77	7/12/77
742.5	742.5	742.5	742.5	742.5	742.5
99	99	99	99	99	99
76	76	76	76	76	76
1000	1000	1000	1000	1000	1000
162.0	162.0	129.3	130.5	86.0	86.0
31.6	31.6	24.8	25.0	16.8	16.8
16.5	16.6	13.6	13.5	9.6	9.6
7.0	7.0	14.0	14.0	30.5	30.5
4.5	4.5	8.5	8.5	14.0	14.0
13.5	13.5	7.5	7.5	3.0	3.0
123	123	124	124	130	130
2360	0325	0770	0124	4064	0210
14.40	14.75	13.11	13.29	14.01	14.50
1.26	95	2.19	2.03	1.30	1.01
1553	226	1142	245	1604	332
1097	1031	1498	1454	1850	1545
15.42	15.44	16.32	16.33	15.40	15.50
238.2	32.9	69.8	11.2	242.4	12.5
78.7	11.5	52.0	11.1	48.0	10.0
205.6	193.9	252.5	243.9	205.0	171.4
202	202	193	193	202	202
47	47	47	47	47	47
169	169	170	170	170	170
14.0	9.0	10.0	6.0	6.0	4.0
1001	983	906	875	766	752

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS

21

	10.01	10.02	11.01	11.02	12.01	12.02
CO, %	2405	0124	3514	0320	0955	0147
CO2, %	13.60	14.50	13.03	13.29	13.03	13.09
O2, %	1.55	.78	2.05	1.79	2.58	2.48
HC, PPMC	1568	329	477	1015	553	113
NOX, PPN	787	787	140	136	71	73
AIR/FUEL RATIO	15.65	15.33	16.09	16.00	16.63	16.65
EMISSION RATES, G/HR						
CO	119.3	5.9	160.7	14.5	39.5	6.3
HC	39.1	7.9	11.0	23.1	11.5	2.4
NOX*	72.5	69.8	12.3	11.9	5.7	6.0
OIL TEMPERATURE, F	197	197	194	194	193	193
OIL PRESSURE, PSI	48	48	52	52	52	52
COOLANT TEMPERATURE, F	170	170	170	170	171	171
EXHAUST PRESSURE, IN. H2O	4.0	4.0	4.0	3.0	4.0	4.0
EXHAUST TEMPERATURE, F	700	700	720	664	742	742

* CORRECTED SAE J816B
 * CORRECTED FOR HUMIDITY

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS
 CO, %
 CO2, %
 O2, %
 HC, PPMC
 NOX, PPM
 AIR/FUEL RATIO
 EMISSION RATES, G/HR
 CO
 HC
 NOX+
 OIL TEMPERATURE, F
 OIL PFEASURE, PSI
 COOLANT TEMPEFATURE, F
 EXHAUST PRESSURE, IN. H2O
 EXHAUST TEMPERATURE, F

13.01	13.02	14.01	14.02	15.01	15.02
1	2	1	2	1	2
7/20/77	7/20/77	7/19/77	7/19/77	7/13/78	7/13/77
741.6	741.6	741.5	741.5	745.0	745.0
76	76	76	76	79	79
75	75	71	71	80	80
1300	1300	1300	1300	1300	1300
235.0	235.0	193.5	193.5	162.0	162.0
58.2	58.2	47.8	47.8	40.8	40.8
31.2	31.7	24.9	24.9	21.6	21.4
11.0	11.0	12.0	12.0	13.0	13.0
0	0	2.0	2.0	4.0	4.0
75.0	75.0	30.0	30.0	17.5	17.5
108	108	138	138	147	147
3.8077	3.8650	1.6155	.9260	.3962	.0546
12.15	12.18	13.70	14.59	14.29	14.74
.29	.12	.16	.04	.95	.61
1976	1933	1353	379	1196	244
839	858	870	406	703	664
13.21	13.09	14.11	14.42	15.17	15.19
6457.1	6589.2	2322.0	1352.4	521.4	71.2
168.3	165.5	97.7	27.8	79.0	16.0
234.8	241.4	207.0	98.2	155.2	145.4
211	211	213	213	214	214
45	45	60	60	52	52
172	172	171	171	170	170
30.0	17.0	25.0	15.0	14.0	21.0
1086	1078	1125	1195	1147	1165

* CORRECTED SAE J8158
 * CORRECTED FOR HUMIDITY

ENGINE: CHR318
FUEL CODE: 7619

TEST NUMBER
DATA SOURCE CODE

TEST DATE
BAROMETER, MMHG

HUMIDITY, GRAINS/LB
TEMPERATURE, F

ENGINE SPEED, RPM
TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR
IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG
THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F
CONCENTRATIONS, DRY BASIS

CO, %
CO2, %

O2, %
HC, PPMC

NOX, PPM

A/F FUEL RATIO

EMISSION RATES, G/HR

CO
HC
NOX*

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168
* CORRECTED FOR HUMIDITY

16.01	16.02	17.01	17.02	18.01	18.02
1	2	1	2	1	2
7/13/77	7/13/77	7/13/77	7/13/77	7/13/77	7/13/77
745.0	745.0	745.0	745.0	745.0	745.0
79	79	79	79	79	79
78	78	80	80	78	78
1300	1300	1300	1300	1300	1300
129.0	129.0	86.0	86.0	54.0	54.0
31.9	31.9	21.6	21.6	13.4	13.4
19.2	19.1	12.4	12.4	9.6	9.5
13.0	13.0	35.0	35.0	35.0	35.0
5.5	5.5	14.0	14.0	17.5	17.5
14.0	14.0	7.0	7.0	3.0	3.0
173	173	140	140	124	124
3255	3355	893	8113	8896	8108
14.27	14.70	13.76	14.01	13.44	13.74
1.12	80	2.05	1.78	2.51	2.27
1012	181	1483	264	1276	219
541	548	950	925	1020	868
15.33	15.33	16.08	16.05	16.47	16.43
389.7	42.3	71.2	9.0	57.8	6.9
60.8	10.8	59.4	10.6	41.3	7.0
108.7	109.6	127.1	123.4	110.4	93.0
212	212	206	206	205	205
54	54	56	56	56	56
171	171	175	175	172	172
20.0	12.0	9.0	4.0	5.0	4.0
1139	1134	871	863	825	808

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPM

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

19.01	19.02	20.01	20.02	21.01	21.02
1	2	1	2	1	2
7/13/77	7/13/77	7/13/77	7/13/77	7/20/77	7/20/77
745.0	745.0	745.0	745.0	741.6	741.6
79	79	79	79	76	76
84	84	93	93	76	76
1300	1300	1300	1300	1600	1600
21.5	21.5	.6	.6	234.0	234.0
5.4	5.4	.2	.2	71.4	71.4
7.8	7.7	6.2	6.2	37.8	36.9
35.0	35.0	35.0	35.0	12.5	12.5
18.5	18.5	20.0	20.0	.0	.0
2.0	2.0	1.0	1.0	75.0	75.0
124	124	132	132	105	105
1324	0143	1392	0129	4.0799	4.0439
13.06	13.35	13.12	13.41	11.92	11.98
2.55	2.39	2.96	2.43	.24	.10
4899	794	11620	1889	1930	1910
250	291	81	130	640	696
16.06	16.47	15.57	16.36	13.06	13.00
67.9	7.4	53.8	5.3	8600.9	8317.3
126.1	20.7	225.4	38.8	204.3	197.3
21.5	25.3	5.2	9.0	222.6	236.3
200	200	198	198	214	214
60	60	60	60	55	24
170	170	172	172	171	171
5.0	4.0	4.0	3.0	46.0	24.0
778	856	663	998	1149	1136

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAPOMETER, NMHC

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP, F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX*

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

22.01	22.02	23.01	23.02	24.01	24.02
1	2	1	2	1	2
7/13/77	7/13/77	7/13/77	7/13/77	7/13/77	7/13/77
745.0	745.0	745.0	745.0	745.0	745.0
82	82	90	90	90	90
103	103	94	94	94	94
1600	1600	1600	1600	1600	1600
184.5	184.5	154.0	154.0	123.0	123.0
57.6	57.6	47.7	47.7	38.1	38.1
30.3	29.8	26.8	26.5	22.9	22.9
14.0	14.0	13.0	13.0	13.0	13.0
2.0	2.0	3.0	3.0	5.5	5.5
32.0	32.0	24.0	24.0	17.0	17.0
175	175	168	168	185	185
5138	17742	9715	3789	4472	4665
13.70	14.15	13.97	14.61	14.07	14.53
30	12	49	12	74	40
1668	1028	1227	266	809	145
629	722	549	186	466	373
14.63	14.07	14.60	14.70	15.04	15.05
934.4	3021.0	1549.1	600.5	628.3	93.5
152.3	87.9	98.3	21.1	57.1	10.2
194.7	209.3	155.3	52.3	116.2	93.1
222	222	189	175	215	215
5	55	60	60	60	60
175	175	175	175	174	174
34.0	20.0	30.0	18.0	25.0	16.0
1247	1232	1225	1247	1247	1254

ENGINE: CHR318	25.01	25.02	26.01	26.02	27.01	27.02
FUEL CODE: 7619	1	2	1	2	1	2
TEST NUMBER	7/13/77	7/13/77	7/13/77	7/13/77	7/13/77	7/13/77
DATA SOURCE CODE	745.0	745.0	745.0	745.0	745.0	745.0
TEST DATE	90	90	90	90	90	90
BAROMETER, MMHG	94	94	93	93	92	92
HUMIDITY, GRAINS/LB	1600	1600	1600	1600	1600	1600
TEMPERATURE, F	82.0	82.0	51.0	51.0	20.5	20.5
ENGINE SPEED, RPM	25.4	25.4	15.8	15.8	6.3	6.2
TORQUE, FT-LB	14.9	15.0	11.4	11.3	8.7	8.6
POWER, BHP*	35.0	35.0	35.0	35.0	36.0	36.0
FUEL RATE, LB/HR	13.5	13.5	17.5	17.5	20.5	20.5
IGNITION TIMING, DEG BTDC	6.0	6.0	3.0	3.0	1.0	1.0
MANIFOLD VACUUM, IN HG	165	165	142	142	130	130
THROTTLE ANGLE, DEG	7560	7775	2136	2021	1553	10148
INTAKE MAN. TEMP., F	13.64	14.49	13.64	13.79	13.44	13.63
CONCENTRATIONS, DRY BASIS	1.18	.52	1.55	1.25	1.60	1.40
CO, %	1593	263	1169	189	754	133
CO2, %	1248	1052	805	795	288	288
O2, %	15.14	15.14	15.71	15.70	15.81	15.81
HC, PPMC	698.8	71.6	156.2	14.6	87.4	8.4
NOX, PPM	73.9	12.2	43.0	6.9	21.3	3.8
AIR/FUEL RATIO	204.7	172.4	104.5	102.6	28.8	28.9
EMISSION RATES, G/HR						
CO	215	215	210	210	205	205
HC	60	60	60	60	60	60
NOX+	172	172	172	172	173	173
OIL TEMPERATURE, F	14.0	8.0	10.0	6.0	6.0	4.0
OIL PRESSURE, PSI	1002	1100	927	929	868	835
COOLANT TEMPERATURE, F						
EXHAUST PRESSURE, IN. H2O						
EXHAUST TEMPERATURE, F						

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP+
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN TEMP., F
 CONCENTRATIONS, DRY BASIS

28.01	28.02	29.01	29.02	30.01	30.02
1	2	1	2	1	2
7/13/77	7/13/77	7/20/77	7/20/77	7/13/77	7/13/77
745.0	745.0	741.6	741.6	745.0	745.0
90	90	76	76	90	90
91	91	82	82	93	93
1600	1600	2000	2000	2000	2000
6	6	230.0	230.0	194.0	194.0
2	2	88.3	88.3	75.1	75.1
7.3	7.4	47.3	47.3	39.8	38.9
35.0	3.0	14.0	14.0	15.0	15.0
21.5	21.5	.0	.0	3.0	3.0
4.0	.0	75.0	75.0	31.0	31.0
132	132	106	106	131	131

CO, %	1.900	4.1817	4.1952	1.9192	1.8103
CO2, %	13.17	13.41	11.86	13.55	13.67
O2, %	2.03	1.80	.16	.25	.13
HC, PPMC	1697	383	1825	1501	1023
NOX, PPM	120	132	597	1188	1259

AIR/FUEL RATIO

16.01	16.03	12.97	12.93	14.04	14.06
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EMISSION RATES, G/HR

CO	92.6	10582.1	10572.1	4376.7	4045.1
HC	41.5	231.9	215.2	171.9	114.8
NOX+	10.4	249.4	237.2	480.8	499.2

OIL TEMPERATURE, F
 OIL PRESSURE, PSI
 COOLANT TEMPERATURE, F
 EXHAUST PRESSURE, IN. H2O
 EXHAUST TEMPERATURE, F

203	224	220	220	220
60	55	55	60	60
173	175	175	175	175
5.0	52.0	38.0	50.0	34.0
825	1254	1226	1339	1311

* CORRECTED SAE J8168
 + CORRECTED FOR HUMIDITY

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPN

A/F/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

31.01	31.02	32.01	32.02	33.01	33.02
1	2	1	2	1	2
7/13/77	7/13/77	7/13/77	7/13/77	7/13/77	7/13/77
745.0	745.0	745.0	745.0	745.0	745.0
87	87	87	87	87	87
95	95	95	95	93	93
2000	2000	2000	2000	2000	2000
162.0	162.0	130.0	130.0	86.0	86.0
62.8	62.8	49.3	50.4	33.3	33.3
34.3	34.3	30.3	30.3	21.3	21.3
15.0	15.0	15.0	15.0	28.0	28.0
4.0	4.0	5.0	5.0	11.0	11.0
26.0	26.0	21.0	21.0	11.0	11.0
155	155	185	185	207	207
1.0131	9418	4868	2810	6759	1360
14.01	14.24	14.25	14.45	13.84	14.49
35	11	47	20	89	42
1096	401	645	458	1020	194
982	757	531	404	335	259
14.52	14.46	14.86	14.78	15.01	15.02
2056.5	1904.9	899.5	512.8	881.1	177.3
111.7	40.7	59.9	41.9	66.8	12.7
347.7	267.3	171.3	128.7	76.2	58.9
229	229	229	229	226	226
60	60	60	60	60	60
175	175	174	174	172	172
45.0	30.0	40.0	25.0	24.0	14.0
1365	1354	1357	1376	1212	1267

ENGINE: CHR318
FUEL CODE: 7619

TEST NUMBER
DATA SOURCE CODE

TEST DATE
SAPOMETER, MMHG

HUMIDITY, GRAINS/LB
TEMPERATURE, F

ENGINE SPEED, RPM
TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR
IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG
THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F
CONCENTRATIONS, DRY BASIS

CO, %
CO2, %

O2, %
HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION PATES, G/HR
CO
HC
NOX+

OIL TEMPERATURE, F
OIL PPESSURE, PSI

COOLANT TEMPERATURE, F
EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

34.01	34.02	35.01	35.02	36.01	36.02
1	2	1	2	1	2
7/13/77	7/13/77	7/13/77	7/13/77	7/13/77	7/13/77
745.0	745.0	745.0	745.0	745.0	745.0
87	87	87	87	87	87
91	91	90	90	89	89
2000	2000	2000	2000	2000	2000
54.0	54.0	21.6	21.6	.6	.6
20.9	20.9	8.3	8.3	.2	.2
15.4	15.4	11.2	11.4	9.0	9.1
37.0	37.0	37.0	37.0	37.0	37.0
16.5	16.5	20.0	20.0	21.5	21.5
6.0	6.0	3.0	3.0	1.0	1.0
179	179	150	150	138	138
6692	0702	2160	0184	1310	0120
13.63	14.34	13.53	13.74	13.38	13.51
1.23	.71	1.82	1.65	2.14	2.00
992	173	461	81	999	74
540	496	311	310	139	149
15.26	15.26	15.97	15.98	16.19	16.26
641.4	67.1	158.3	13.7	78.3	7.3
47.8	8.3	17.0	3.0	30.0	2.2
90.2	82.8	39.8	40.3	14.5	15.7
219	219	214	214	210	210
60	60	60	60	60	60
173	173	173	173	173	173
15.0	9.0	10.0	6.0	5.0	4.0
1070	1134	995	969	942	900

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAPOMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

37.01	37.02	38.01	38.02	39.01	39.02
1	2	1	2	1	2
7/19/77	7/19/77	7/14/77	7/14/77	7/14/77	7/14/77
741.5	741.5	746.8	746.8	746.8	746.8
76	76	93	93	93	93
77	77	89	89	91	91
2500	2500	2500	2500	2500	2500
226.0	226.0	193.5	193.5	162.0	162.0
107.9	107.9	93.1	93.1	77.6	77.6
58.9	58.6	50.2	50.6	44.0	43.8
17.0	17.0	17.0	17.0	16.5	16.5
1.0	1.0	3.0	3.0	4.0	4.0
75.0	75.0	41.5	41.5	35.5	35.5
105	105	128	128	172	172
3.8962	3.9479	2.8830	2.9424	1.7436	1.7500
12.36	12.33	13.08	12.98	13.52	13.65
.05	.03	.18	.10	.25	.10
1390	1341	1469	1223	1207	763
811	783	887	844	820	780
13.10	13.07	13.60	13.54	14.12	14.07
12342.2	12410.6	8048.5	8241.2	4499.6	4472.3
221.1	211.6	205.9	172.1	156.4	97.9
425.3	407.5	446.2	425.8	381.4	359.2
231	231	238	238	242	242
60	60	58	58	58	58
175	175	174	174	176	176
76.0	58.0	75.0	52.0	66.0	43.0
1350	1328	1406	1380	1430	1405

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS
 CO, %
 CO2, %
 O2, %
 HC, PPMC
 NOX, PPM
 AIR/FUEL RATIO
 EMISSION RATES, G/HR
 CO
 HC
 NOX+
 OIL TEMPERATURE, F
 OIL PRESSURE, PSI
 COOLANT TEMPERATURE, F
 EXHAUST PRESSURE, IN. H2O
 EXHAUST TEMPERATURE, F
 * CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

40.01	40.02	41.01	41.02	42.01	42.02
1	2	1	2	1	2
7/14/77	7/14/77	7/14/77	7/14/77	7/14/77	7/14/77
746.8	746.8	746.7	746.7	746.7	746.7
93	107	107	107	107	107
85	85	88	88	83	83
2500	2500	2500	2500	2500	2500
129.0	129.0	87.1	87.8	53.3	52.3
61.8	63.2	42.7	43.0	25.6	25.6
38.9	39.0	25.4	26.7	20.8	20.6
16.0	16.0	32.0	32.0	39.0	39.0
5.0	5.0	11.0	11.0	15.0	15.0
30.0	30.0	18.0	18.0	13.5	13.5
193	193	214	214	207	207
8250	5750	3976	0738	5582	0776
13.75	14.22	13.76	14.13	13.50	14.12
35	10	95	65	1.12	.67
587	144	686	143	834	141
570	240	470	460	289	283
14.63	14.62	15.23	15.23	15.25	15.23
1978.4	1368.8	642.1	125.2	726.3	101.7
70.7	17.2	55.6	12.2	54.5	9.3
246.3	110.8	147.3	151.4	73.1	72.0
241	241	234	234	227	227
58	58	58	58	61	61
178	178	176	176	173	173
56.0	37.0	30.0	25.0	20.0	15.0
1458	1458	1260	1290	1167	1212

ENGINE: CHR318
FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP, F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

A/F/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

43.01	43.02	44.01	44.02	45.01	45.02
1	2	1	2	1	2
7/14/77	7/14/77	7/14/77	7/14/77	7/20/77	7/20/77
745.6	745.6	745.6	745.6	741.6	741.6
98	98	98	98	74	74
81	81	82	82	84	84
2500	2500	2500	2500	3000	3000
22.8	22.2	2.5	1.5	215.0	215.0
10.9	10.6	1.2	.7	122.1	124.0
15.0	15.2	11.7	11.7	68.4	68.3
38.0	38.0	38.0	38.0	19.0	19.0
19.5	19.5	21.0	21.0	2.0	2.0
10.0	10.0	8.0	8.0	75.0	75.0
155	155	152	152	113	113
3557	3552	1371	10124	3.7271	3.7004
13.35	13.74	13.14	13.26	12.04	12.07
1.57	1.26	2.03	2.09	.14	.08
412	84	243	55	1498	1394
212	206	165	181	828	839
15.72	15.69	16.22	16.35	13.17	13.16
343.8	34.3	107.1	9.7	14477.2	13690.2
20.0	4.1	9.5	2.2	292.2	259.0
37.7	36.9	23.7	26.1	528.0	509.4
220	220	221	221	248	248
63	63	63	63	55	55
178	178	175	175	172	172
10.0	6.0	8.0	6.0	135.0	86.0
1077	1076	1043	998	1432	1420

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

A/F/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

* CORRECTED FOR HUMIDITY

46.01	46.02	47.01	47.02	48.01	48.02
1	2	1	2	1	2
7/14/77	7/14/77	7/14/77	7/14/77	7/14/77	7/14/77
744.5	744.5	744.5	744.5	744.5	744.5
117	117	117	117	117	117
92	92	111	111	108	108
3000	3000	3000	3000	3000	3000
193.5	193.5	162.0	162.0	129.0	129.0
113.0	113.0	96.3	96.2	76.4	76.4
62.2	62.9	55.3	55.1	47.2	46.4
17.0	17.0	18.0	18.0	18.0	18.0
3.0	3.0	4.0	4.0	5.5	5.5
47.0	47.0	41.0	41.0	34.0	34.0
116	116	176	176	191	191
3.3566	3.5373	2.7790	2.8773	1.6286	1.6768
12.64	12.40	12.90	12.78	13.39	13.36
.15	.10	.16	.10	.20	.10
1564	1371	1425	1308	920	722
686	643	555	546	476	489
13.36	13.26	13.60	13.53	14.15	14.08
11431.5	12114.6	8768.5	8791.1	4451.8	4480.3
267.6	235.9	225.8	200.8	126.3	96.8
478.5	451.1	358.6	341.6	266.6	267.5
241	241	245	245	240	240
63	68	58	58	60	60
176	176	175	175	176	176
105.0	73.0	90.0	61.0	72.0	49.0
1432	1400	1432	1397	1465	1449

ENGINE: CHR318	49.01	49.02	50.01	50.02	51.01	51.02
FUEL CODE: 7619	1	2	1	2	1	2
TEST NUMBER	7/14/77	7/14/77	7/14/77	7/14/77	7/14/77	7/14/77
DATA SOURCE CODE	744.5	744.5	744.5	744.5	744.5	744.5
TEST DATE	121	121	121	121	121	121
BAROMETER, MMHG	106	106	105	105	103	103
HUMIDITY, GRAINS/LB	3000	3000	3000	3000	3000	3000
TEMPERATURE, F	86.0	86.0	53.0	53.0	21.5	21.5
ENGINE SPEED, RPM	50.9	50.9	31.3	31.3	12.7	12.7
TORQUE, FT-LB	31.3	31.3	24.9	24.9	19.3	19.3
POWER, BHP*	36.0	36.0	41.0	41.0	41.0	41.0
FUEL RATE, LB/HR	11.5	11.5	15.0	15.0	18.0	18.0
IGNITION TIMING, DEG BTDC	20.5	20.5	16.0	16.0	12.0	12.0
MANIFOLD VACUUM, IN HG	213	213	215	215	203	203
THROTTLE ANGLE, DEG						
INTAKE MAN. TEMP., F						
CONCENTRATIONS, DRY BASIS						
CO, %	9273	6943	1.0194	4611	9670	2722
CO2, %	13.54	13.97	13.39	14.08	13.43	14.23
O2, %	53	13	64	14	69	18
HC, PPMC	1015	266	1041	229	732	126
NOX, PPM	603	177	295	131	176	86
AIR/FUEL RATIO	14.66	14.57	14.68	14.68	14.77	14.80
EMISSION RATES, G/HR						
CO	1742.0	1294.1	1525.6	688.5	1127.3	319.3
HC	95.8	24.9	78.2	17.2	42.8	7.4
NOX+	238.2	69.2	92.9	41.1	43.1	21.3
OIL TEMPERATURE, F	241	241	235	235	232	232
OIL PRESSURE, PSI	60	60	62	62	62	62
COOLANT TEMPERATURE, F	173	173	173	173	173	173
EXHAUST PRESSURE, IN. H2O	38.0	24.0	27.0	16.0	19.0	11.0
EXHAUST TEMPERATURE, F	1288	1325	1215	1266	1179	1227

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

52.01

52.02

53.01

53.02

54.01

54.02

7/14/77

7/14/77

7/20/77

7/20/77

7/19/77

7/19/77

744.5

744.5

741.6

741.6

741.5

741.5

121

121

74

74

81

81

102

102

83

83

71

71

3000

3000

3500

3500

3500

3500

1.6

1.6

198.0

198.0

173.0

173.0

1.0

1.0

131.2

131.2

115.2

115.2

14.8

15.0

75.4

75.6

68.1

68.2

41.0

41.0

20.0

20.0

20.0

20.0

21.0

21.0

2.5

2.5

4.0

4.0

9.5

9.5

75.0

75.0

47.0

47.0

173

173

113

113

111

111

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAPOMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

55.01	55.02	56.01	56.02	57.01	57.02
1	2	1	2	1	2
7/19/77	7/19/77	7/19/77	7/19/77	7/19/77	7/19/77
741.5	741.5	741.5	741.5	741.5	741.5
81	81	81	81	81	81
77	77	78	78	79	79
3500	3500	3500	3500	3500	3500
144.0	144.0	115.0	115.0	77.0	77.0
96.4	96.4	77.1	77.1	51.6	51.6
59.2	58.9	50.7	50.6	34.5	34.6
20.0	20.0	21.0	21.0	40.0	40.0
4.5	4.5	6.0	6.0	12.0	12.0
42.0	42.0	34.0	34.0	22.0	22.0
163	163	178	178	193	193
2.4637	2.4289	1.3112	1.1993	.5200	.1237
13.38	13.48	14.15	14.32	14.37	14.81
.13	.07	.19	.08	.52	.30
1119	871	566	322	439	116
569	598	516	503	785	547
13.76	13.77	14.33	14.33	14.91	14.96
8189.0	8038.9	3875.3	3538.2	1087.4	260.0
186.8	144.7	84.0	47.7	46.1	12.3
320.1	335.0	258.3	251.4	278.0	194.6
252	252	254	254	251	251
58	58	60	60	60	60
174	174	173	173	170	170
110.0	73.0	80.0	61.0	50.0	31.0
1495	1462	1536	1512	1370	1400

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS

37

	58.01	58.02	59.01	59.02	60.01	60.02
CO, %	5947	1655	6560	1697	6167	692
CO2, %	14.27	14.81	14.25	14.83	14.16	14.76
O2, %	.72	.37	.73	.32	.85	.54
HC, PPMC	415	89	386	84	354	51
NOX, PPM	443	358	201	169	136	129
AIR/FUEL RATIO	15.00	14.99	14.97	14.94	15.07	15.14
EMISSION RATES, G/HR						
CO	1002.0	284.8	911.5	235.5	730.5	80.7
HC	35.1	7.7	27.0	5.8	21.1	3.0
NOX+	126.2	104.2	47.2	39.8	27.3	25.4
OIL TEMPERATURE, F	243	243	238	238	235	235
OIL PRESSURE, PSI	60	0	60	60	61	61
COOLANT TEMPERATURE, F	171	171	171	171	171	171
EXHAUST PRESSURE, IN. H2O	35.0	22.0	26.0	15.0	20.0	13.0
EXHAUST TEMPERATURE, F	1316	1341	1301	1323	1273	1285

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

61.01	61.02	62.01	62.02	63.01	63.02
1	2	1	2	1	2
7/20/77	7/20/77	7/19/77	7/19/77	7/19/77	7/19/77
741.6	741.6	741.5	741.5	741.5	741.5
74	74	76	76	76	76
74	74	73	73	78	78
4000	4000	4000	4000	4000	4000
176.0	176.0	156.6	156.6	130.5	130.5
133.3	133.3	119.2	119.2	99.8	99.8
81.0	81.1	72.9	73.4	64.8	64.5
21.0	21.0	21.0	21.0	21.0	21.0
2.0	2.0	4.0	4.0	5.0	5.0
75.0	75.0	49.0	49.0	44.0	44.0
100	100	131	131	162	162
3.8190	3.8299	3.7263	3.6606	2.5946	2.4838
11.99	11.96	12.58	12.61	13.50	13.61
.10	.06	.54	.30	.61	.32
1270	1166	1280	1072	998	752
820	771	567	599	545	578
13.13	13.11	13.48	13.38	14.02	13.92
17528.4	17629.7	14988.4	14719.4	9590.0	9082.1
292.7	269.6	258.6	216.5	185.3	138.0
617.8	582.5	377.4	398.5	333.1	349.7
227	227	247	247	262	262
60	60	60	60	60	60
173	173	174	174	175	175
150.0	100.0	145.0	98.0	129.0	86.0
1467	1451	1490	1462	1523	1491

ENGINE: CHR318
FUEL CODE: 7619
TEST NUMBER
DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

A/F/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX*

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

* CORRECTED FOR HUMIDITY

64.01	64.02	65.01	65.02	66.01	66.02
1	2	1	2	1	2
7/19/77	7/19/77	7/19/77	7/19/77	7/19/77	7/19/77
741.5	741.5	741.5	741.5	741.5	741.5
76	76	76	76	76	76
80	80	82	82	78	78
4000	4000	4000	4000	4000	4000
104.0	104.0	70.0	70.0	44.0	44.0
78.7	79.7	53.0	53.7	33.3	33.7
55.9	55.5	39.0	39.0	32.4	32.4
21.0	21.0	40.0	40.0	43.0	43.0
6.5	6.5	12.0	12.0	14.5	14.5
36.0	36.0	24.0	24.0	20.0	20.0
176	176	190	190	192	192
1.5145	1.3321	.8383	.5718	.8796	.5665
14.22	14.41	14.46	14.80	14.35	14.77
.59	.39	.77	.55	.82	.47
542	245	692	206	588	170
532	517	787	479	463	286
14.50	14.49	14.90	14.91	14.91	14.86
4839.4	4343.8	1920.2	1348.6	1684.9	1107.0
86.9	40.2	79.6	24.4	56.6	16.7
281.2	279.2	298.3	186.9	146.7	92.5
262	262	256	256	253	253
60	60	60	60	60	60
174	174	169	169	172	172
109.0	72.0	59.0	38.0	41.0	25.0
1557	1530	1392	1405	1345	1362

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

67.01	67.02	68.01	68.02	69.01	69.02
7/19/77	7/19/77	7/19/77	7/19/77	7/15/77	7/15/77
741.5	741.5	741.5	741.5	744.5	744.5
76	76	76	76	82	82
75	75	74	74	95	95
4000	4000	4000	4000	800	800
17.0	17.0	2.4	2.4	1.4	1.4
12.9	13.0	1.8	1.8	2	2
26.6	26.5	23.5	23.4	4.8	4.8
43.0	43.0	43.0	43.0	7.0	7.0
17.0	17.0	18.5	18.5	18.0	18.0
16.0	16.0	14.0	14.0	0	0
196	196	196	196	141	141
9684	6509	8801	4094	5485	1854
14.29	14.69	14.09	14.61	13.45	13.99
.84	.39	.61	.18	1.40	.35
536	141	481	120	2739	1041
214	139	156	80	40	52
14.89	14.77	14.78	14.74	15.24	14.86
1519.7	1035.5	1242.9	574.2	166.1	56.1
42.2	11.3	34.1	8.5	41.6	15.8
55.5	36.6	36.5	18.6	2.1	2.7
247	247	245	245	177	177
60	60	60	60	45	45
171	171	171	171	173	173
32.0	18.0	25.0	17.0	2.0	2.0
1342	1344	1339	1348	546	593

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS

	70.01	70.02	71.01	71.02	72.01	72.02
	1	2	1	2	1	2
7/15/77	7/15/77	77/15/77	7/15/77	7/15/77	7/15/77	7/15/77
744.5	744.5	744.5	744.5	744.5	744.5	744.5
82	82	82	82	82	82	82
95	95	95	95	95	95	95
800	800	800	800	800	600	600
20.0	20.0	20.0	40.0	40.0	39.0	39.0
3.0	3.1	3.1	6.2	6.2	4.5	4.5
6.1	6.1	6.1	6.4	6.4	4.8	4.9
7.0	7.0	7.0	8.0	8.0	7.0	8.0
16.5	16.5	16.5	16.0	16.0	14.5	14.5
1.0	1.0	1.0	1.5	1.5	.0	.0
144	144	144	146	146	149	149
CO, %	3951	3361	6910	6450	3516	2301
CO2, %	13.94	14.10	13.90	14.00	13.49	13.60
O2, %	1.59	1.42	1.35	1.20	2.24	2.05
HC, PPMC	1278	1166	1518	1449	1769	1562
NOX, PPM	111	119	142	143	112	120
AIR/FUEL RATIO	15.59	15.50	15.25	15.18	16.03	15.98
EMISSION RATES, G/HR						
CO	149.5	128.6	277.1	257.3	111.4	73.5
HC	24.3	22.4	30.6	29.0	28.1	25.1
NOX+	7.2	7.7	9.7	9.7	6.0	6.5
OIL TEMPERATURE, F	184	184	186	186	186	186
OIL PRESSURE, PSI	44	44	44	44	31	31
COOLANT TEMPERATURE, F	174	174	174	174	171	171
EXHAUST PRESSURE, IN. H2O	2.0	2.0	2.0	2.0	2.0	2.0
EXHAUST TEMPERATURE, F	579	501	593	500	511	444

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS
 CO, %
 CO2, %
 O2, %
 HC, PPMC
 NOX, PPM
 AIR/FUEL RATIO
 EMISSION RATES, G/HR
 CO
 HC
 NOX+
 OIL TEMPERATURE, F
 OIL PRESSURE, PSI
 COOLANT TEMPERATURE, F
 EXHAUST PRESSURE, IN. H2O
 EXHAUST TEMPERATURE, F
 * CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

73.01	73.02	74.01	74.02	75.01	75.02
1	2	1	2	1	2
7/15/77	7/15/77	7/15/77	7/15/77	7/15/77	7/15/77
744.5	744.5	744.5	744.5	744.5	744.0
82	82	82	82	74	74
95	95	96	96	76	76
1000	1000	1000	1000	1000	1000
1.0	1.0	53.0	53.0	86.0	86.0
2	2	10.3	10.3	16.3	16.4
6.2	6.2	7.7	7.7	9.4	9.3
7.0	7.0	30.0	30.0	29.0	29.0
19.5	19.5	17.0	17.0	13.5	13.5
1.0	1.0	2.5	2.5	5.0	5.0
145	145	146	146	125	125
3956	0247	6401	5584	0656	0090
14.04	14.43	14.25	14.32	13.84	14.02
1.40	1.07	.89	.84	2.29	2.14
818	168	2005	1889	1526	371
68	73	780	747	1649	1579
15.50	15.51	14.94	14.95	16.28	16.31
155.5	9.7	300.5	262.4	40.8	5.6
16.1	3.3	47.3	44.6	47.6	11.5
4.5	4.9	62.3	59.7	168.1	160.1
187	187	193	193	177	177
55	55	50	50	65	65
175	175	174	174	173	173
2.0	2.0	2.0	2.0	6.0	4.0
630	558	616	571	678	661

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

76.01	76.02	77.01	77.02	78.01	78.02
1	2	1	2	1	2
7/15/77	7/15/77	11/15/77	7/15/77	7/15/77	7/15/77
744.0	744.0	744.0	744.5	744.0	744.0
74	74	74	74	74	74
71	71	73	73	74	74
1000	1000	1300	1300	1300	1300
162.0	162.0	1.2	1.2	54.0	54.0
30.7	30.6	.3	.3	13.2	13.3
16.5	16.7	6.2	6.2	9.3	9.4
8.0	29.0	34.0	34.0	34.0	34.0
3.0	3.0	20.5	20.5	17.0	17.0
17.0	17.0	2.0	2.0	5.0	5.0
128	128	140	140	137	137
.2409	.0262	.1153	.0133	.0904	.0095
14.51	14.85	13.01	13.25	12.96	13.20
1.30	1.00	3.13	2.40	2.56	2.31
1223	273	11607	3143	1534	402
1033	1082	71	109	920	857
15.47	15.47	15.71	16.20	16.53	16.50
249.6	26.5	45.3	5.5	57.7	6.1
63.6	13.9	229.1	65.3	49.2	12.9
175.4	179.6	4.6	7.4	96.3	89.8
195	195	194	194	188	188
45	45	60	60	60	60
172	172	172	172	171	171
11.0	8.0	5.0	3.0	7.0	6.0
938	915	566	599	747	727

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PFEASURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

82.01	82.02	83.01	83.02	84.01	84.02
1	2	1	2	1	2
7/15/77	7/15/77	7/15/77	7/15/77	7/15/77	7/15/77
744.0	744.0	744.0	744.0	744.0	744.0
74	74	74	74	74	74
73	73	73	73	74	74
1600	1600	1600	1600	1600	1600
51.0	51.0	82.0	82.0	154.0	154.0
15.5	15.5	24.9	24.9	46.8	46.8
11.7	11.7	14.0	14.1	25.9	25.0
35.0	35.0	35.0	35.0	13.0	13.0
17.5	17.5	15.0	15.0	3.5	3.5
6.5	6.5	8.5	8.5	25.0	25.0
124	124	122	122	160	160
1054	0119	1753	0183	3921	0404
13.14	13.32	13.36	13.76	13.95	14.33
2.17	2.00	1.74	1.41	.75	.58
1096	274	1305	301	882	253
912	904	1433	1293	572	671
16.26	16.28	15.89	15.82	15.07	15.19
82.3	9.3	160.2	16.7	624.5	62.5
43.0	10.7	59.9	13.8	70.5	19.6
116.9	115.3	214.6	193.1	149.4	170.3
202	202	206	206	214	214
60	60	60	60	55	55
175	175	176	176	174	174
10.0	5.0	10.0	6.0	25.0	18.0
825	794	873	871	1215	1220

ENGINE: CHR318
FUEL CODE: 7619

TEST NUMBER
DATA SOURCE CODE

TEST DATE
BAROMETER, MMHG
HUMIDITY, GRAINS/LB
TEMPERATURE, F

ENGINE SPEED, RPM
TORQUE, FT-LB
POWER, BHP*

FUEL RATE, LB/HR
IGNITION TIMING, DEG BTDC
MANIFOLD VACUUM, IN HG
THROTTLE ANGLE, DEG
INTAKE MAN. TEMP., F
CONCENTRATIONS, DRY BASIS

CO, %
CO2, %
O2, %
HC, PPMC
NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO
HC
NOX+

OIL TEMPERATURE, F
OIL PRESSURE, PSI
COOLANT TEMPERATURE, F
EXHAUST PRESSURE, IN. H2O
EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

88.01	88.02	89.01	89.02	90.01	90.02
1	2	1	2	1	2
7/18/78	7/18/77	7/18/77	7/18/77	7/18/77	7/18/77
744.6	744.6	744.6	744.6	744.6	744.6
129	110	110	110	110	110
76	76	73	73	77	77
2000	2000	2500	2500	2500	2500
161.0	162.0	2.6	1.7	53.8	54.3
61.8	62.0	1.2	.8	25.8	26.0
34.0	34.0	11.3	11.4	20.3	20.4
15.0	15.0	39.0	39.0	39.0	39.0
3.5	3.5	21.5	21.5	15.5	15.5
32.0	32.0	7.0	7.0	13.0	13.0
171	171	131	131	165	165
1.1230	.8867	.1988	.0187	.7560	.1375
13.70	13.98	13.01	13.22	13.33	14.14
.32	.05	2.08	1.92	1.10	.49
1094	364	362	105	977	162
652	490	164	182	259	264
14.44	14.43	16.22	16.22	15.13	15.08
2308.0	1775.9	153.5	14.2	952.4	172.5
112.9	36.6	14.0	4.0	61.8	10.2
295.6	193.0	25.0	27.2	64.1	65.2
227	227	214	214	221	221
58	58	63	63	62	62
175	175	177	177	178	178
38.0	28.0	6.0	4.0	16.0	10.0
1333	1329	969	925	1107	1164

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

91.01	91.02	92.01	92.02	93.01	93.02
1	2	1	2	1	2
7/18/77	7/18/77	7/18/77	7/18/77	7/18/77	7/18/77
744.6	744.6	744.6	744.6	745.9	745.9
110	110	110	110	88	88
75	75	80	80	80	80
2500	2500	2500	2500	3000	3000
87.7	84.9	157.9	160.9	1.8	5.6
42.0	40.6	75.9	77.3	1.0	3.2
25.6	25.5	43.0	43.0	14.9	14.9
34.0	34.0	17.0	17.0	41.5	41.5
11.5	11.5	4.0	4.0	20.7	20.7
17.0	17.0	35.0	35.0	9.5	9.5
183	183	170	170	145	145
6812	1747	1.5425	1.6388	4740	.0325
13.48	14.19	13.49	13.51	13.52	13.06
.96	.38	.20	.04	1.45	1.17
874	175	1044	802	251	52
421	354	619	632	138	154
15.08	14.99	14.18	14.06	15.58	15.63
1077.6	272.5	3850.5	4056.8	455.9	31.0
69.5	13.7	130.9	99.7	12.1	2.5
131.2	108.8	304.3	308.0	23.2	25.8
229	229	237	237	209	209
60	60	58	58	65	65
179	179	178	178	176	176
25.0	16.0	58.0	40.0	10.0	7.0
1187	1249	1404	1379	1127	1119

ENGINE: CHR318
FUEL CODE: 7619

TEST NUMBER
DATA SOURCE CODE

TEST DATE
BAROMETER, MMHG

HUMIDITY, GRAINS/LB
TEMPERATURE, F

ENGINE SPEED, RPM
TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR
IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG
THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F
CONCENTRATIONS, DRY BASIS

CO, %
CO2, %

O2, %
HC, PPMC

NOX, PPM
AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

94.01	94.02	95.01	95.02	96.01	96.02
1	2	1	2	1	2
7/18/77	7/18/77	7/18/77	7/18/77	7/18/77	7/18/77
745.9	745.9	745.9	745.9	743.5	743.5
88	88	88	88	103	103
75	75	76	76	82	82
3000	3000	3000	3000	3000	3000
53.0	53.0	86.0	86.0	154.6	154.0
30.8	30.8	49.9	49.9	89.3	89.0
24.6	24.6	30.7	30.7	53.6	53.6
41.0	41.0	37.0	37.0	19.0	19.0
15.0	15.0	11.5	11.5	4.0	4.0
15.5	15.5	20.0	20.0	40.0	40.0
188	188	184	184	171	171
.7528	.1864	.6428	.1862	2.0570	2.2590
13.76	14.36	13.82	14.41	13.30	13.10
.93	.34	.74	.31	.17	.07
653	120	617	119	1055	893
300	238	616	478	685	641
15.04	14.95	14.98	14.94	13.94	13.81
1147.6	284.6	1226.0	352.9	6291.5	6851.6
50.0	9.2	59.1	11.4	162.1	136.1
80.2	63.7	206.3	159.0	396.8	368.2
233	233	238	238	249	249
62	62	60	60	58	58
176	176	177	177	179	179
24.0	16.0	33.0	25.0	84.0	59.0
1226	1274	1284	1320	1456	1422

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS

	97.01	97.02	98.01	98.02	99.01	99.02
CO, %	9109	2283	10590	6103	7557	2758
CO2, %	13.91	14.65	13.97	14.56	14.42	14.98
O2, %	80	29	65	17	13	05
HC, PPMC	439	103	730	191	623	142
NOX, PPM	121	81	392	242	655	376
AIR/FUEL RATIO	14.90	14.90	14.71	14.65	14.53	14.72
EMISSION RATES, G/HR						
CO	1053.5	266.4	1851.0	1060.2	1534.1	561.9
HC	25.5	6.0	64.1	16.7	63.5	14.6
NOX+	23.1	15.7	113.3	69.6	219.9	126.9
OIL TEMPERATURE, F	236	236	235	235	214	214
OIL PRESSURE, PSI	60	60	60	60	60	60
COOLANT TEMPERATURE, F	171	171	175	175	173	173
EXHAUST PRESSURE, IN. H2O	20.0	11.0	31.0	20.0	40.0	26.0
EXHAUST TEMPERATURE, F	1264	297	1268	1316	1278	1328

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY

ENGINE: CHR318

FUEL CODE: 7619

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

MANIFOLD VACUUM, IN HG

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

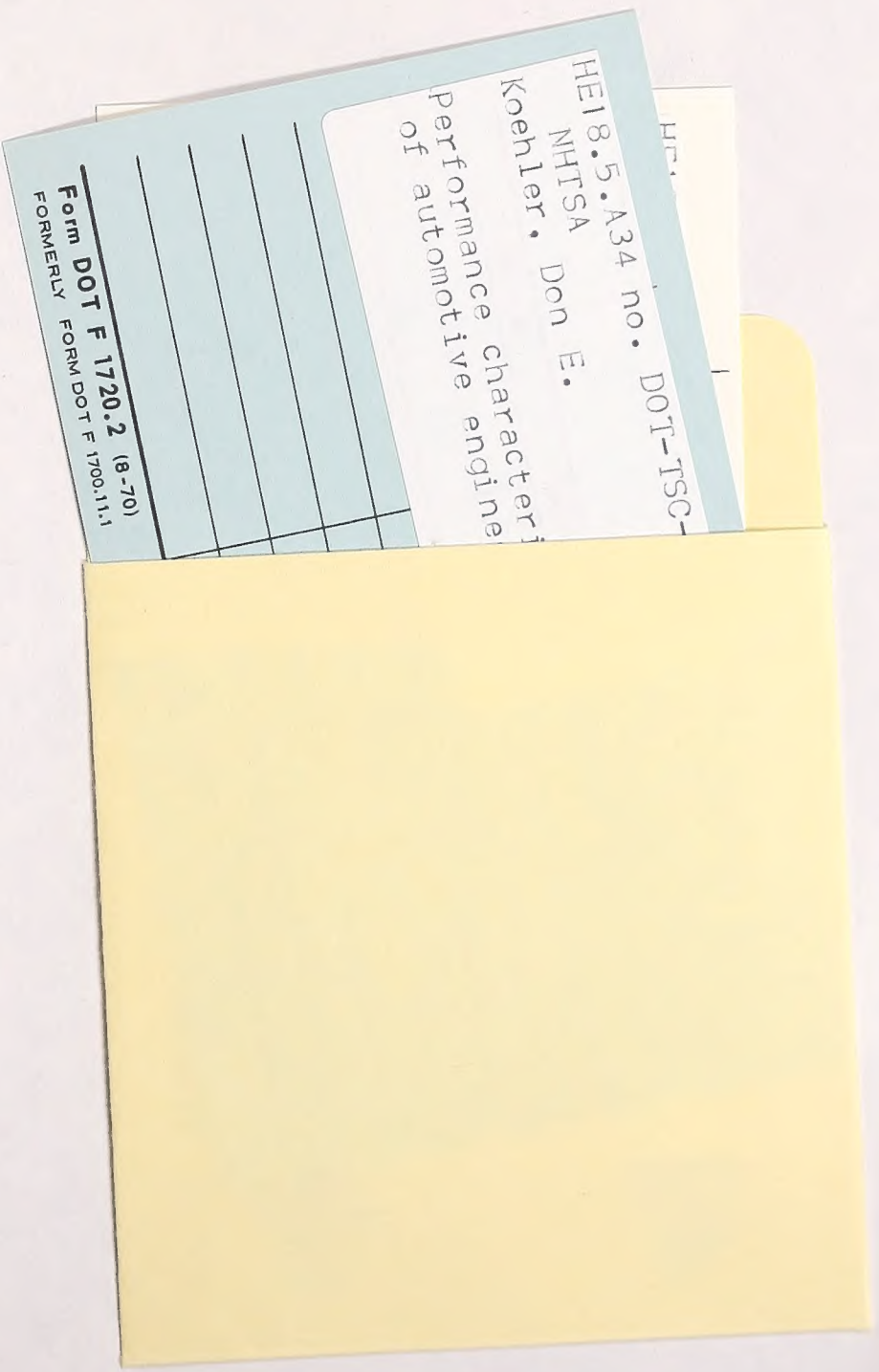
+ CORRECTED FOR HUMIDITY

	100.01	100.02	101.01	101.02	102.01	102.02
	1	2	1	2	1	2
7/19/77	7/19/77	7/19/77	7/19/77	7/19/77	7/26/77	7/19/78
741.5	741.5	741.5	741.5	741.5	741.5	741.5
76	76	76	76	76	76	76
78	78	75	75	75	76	76
3500	3500	4000	4000	4000	4000	4000
144.0	144.0	2.4	2.4	2.4	44.0	44.0
96.4	96.4	1.8	1.8	1.8	33.3	33.3
58.0	58.1	23.2	23.0	23.0	32.7	33.2
20.0	20.0	43.0	43.0	43.0	43.0	43.0
5.0	5.0	18.0	18.0	18.0	14.5	14.5
41.0	41.0	14.0	14.0	14.0	20.0	20.0
163	163	204	204	204	186	186
2.1936	2.1684	.8281	.3333	.9260	.6776	.6776
13.79	13.85	14.44	14.95	14.44	14.74	14.74
.04	.02	.10	.04	.08	.03	.03
987	780	392	113	666	214	214
565	570	154	83	479	349	349
13.84	13.87	14.49	14.69	14.42	14.53	14.53
7170.1	7109.3	1131.3	457.1	1770.7	1314.9	1314.9
162.0	128.5	26.9	7.8	64.0	20.9	20.9
305.7	309.4	34.8	18.8	151.6	112.0	112.0
246	246	245	245	246	246	246
60	60	60	60	60	60	60
173	173	171	171	175	175	175
100.0	68.0	45.0	12.0	40.0	25.0	25.0
1481	1450	1351	1351	1328	1340	1340

ENGINE: CHR318
 FUEL CODE: 7619
 TEST NUMBER
 DATA SOURCE CODE
 TEST DATE
 BAROMETER, MMHG
 HUMIDITY, GRAINS/LB
 TEMPERATURE, F
 ENGINE SPEED, RPM
 TORQUE, FT-LB
 POWER, BHP*
 FUEL RATE, LB/HR
 IGNITION TIMING, DEG BTDC
 MANIFOLD VACUUM, IN HG
 THROTTLE ANGLE, DEG
 INTAKE MAN. TEMP., F
 CONCENTRATIONS, DRY BASIS

	103.01	103.02	104.01	104.02	105.01	105.02
CO, %	1.0205	9282	2.2031	2.2900	3.8240	3.8155
CO2, %	14.43	14.63	13.80	13.74	12.06	12.11
O2, %	.07	.03	.04	.02	.06	.05
HC, PPMC	820	341	867	680	1460	1389
NOX, PPM	731	659	568	558	912	890
AIR/FUEL RATIO	14.37	14.43	13.85	13.82	13.10	13.11
EMISSION RATES, G/HR						
CO	2294.5	1973.9	7809.1	8158.5	17952.2	17885.9
HC	92.6	36.4	154.4	121.7	344.1	327.0
NOX+	272.0	232.0	333.4	328.8	666.2	649.2
OIL TEMPERATURE, F	250	250	256	256	255	255
OIL PRESSURE, PSI	60	60	60	60	60	60
COOLANT TEMPERATURE, F	175	175	174	174	175	175
EXHAUST PRESSURE, IN. H2O	50.0	32.0	120.0	81.0	165.0	115.0
EXHAUST TEMPERATURE, F	1348	1351	1522	1488	1470	1461

* CORRECTED SAE J816B
 + CORRECTED FOR HUMIDITY



HE18.5.A34 no. DOT-TSC-

NHTSA
Koehler, Don E.

performance character
of automotive engine

Form DOT F 1720.2 (8-70)
FORMERLY FORM DOT F 1700.11.1



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